

MCHB-TS-OHP (40)

MEMORANDUM FOR, Commander, U.S. Army Soldier and Biological  
Chemical Command, ATTN: AMSSB-RCB-RS, Aberdeen Proving Ground,  
MD 21010-5423

SUBJECT: License SUB-1435 Termination Standard Review Plan  
No. 26-MA-5970-01, Jefferson Proving Ground, Madison, IN,  
July 2001

1. The subject license termination plan with an Executive Summary  
is enclosed. This plan was developed for Jefferson Proving Ground,  
IN, with respect to NUREG-1727, NMSS Decommissioning Standard  
Review Plan.

2. The point of contact may be reached at DSN 584-3502 or  
commercial (410) 436-3502.

FOR THE COMMANDER:

Encl

MARK A. MELANSON  
LTC, MS  
Program Manager  
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LICENSE SUB-1435 TERMINATION STANDARD REVIEW PLAN  
NO. 26-MA-5970-01  
JEFFERSON PROVING GROUND  
MADISON, INDIANA  
JULY 2001

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referred to Commander, U.S. Army Soldier and Biological  
Chemical Command, ATTN: AMSSB-RCB-RS, Aberdeen Proving  
Ground, MD 21010-5423.

7/24/01

EXECUTIVE SUMMARY  
LICENSE SUB-1435 TERMINATION STANDARD REVIEW PLAN  
NO. 26-MA-5970-01  
JEFFERSON PROVING GROUND  
MADISON, INDIANA  
JULY 2001

1. PURPOSE. This License Termination Standard Review Plan (SRP) is being developed to support U.S. Nuclear Regulatory Commission license SUB-1435 termination under restricted conditions for Jefferson Proving Ground (JPG), IN, and to describe institutional controls to support the License Termination Plan (LTP).

2. CONCLUSION. The LTP supports termination of U.S. Nuclear Regulatory Commission License Number SUB-1435 under restricted release conditions as defined in Subpart E 10 CFR 20.1403 (b). Exposures, based on dose modeling, to critical groups are within regulatory guidelines for restricted release. The results of the exposure and dose assessments support release of JPG lands for restricted use as defined by the U.S. Nuclear Regulatory Commission. Although the human safety hazards presented by depleted uranium may be outweighed by hazards presented from unexploded ordnance it should be noted that these dose results pertain only to depleted uranium, not to additional risk of death or injury from exposure to unexploded ordnance. No depleted uranium remediation is planned at the site because the radiological dose estimation does not justify any further action.

3. RECOMMENDATION. The recommendation for license termination will be evaluated based on restricted use governed by institutional controls and an exposure to the critical group of less than twenty-five millirem per year for surrounding populations and one hundred millirem per year for the Depleted Uranium Impact Area under failure of institutional controls.

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MADISON, INDIANA  
JULY 2001

STANDARD REVIEW PLAN  
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## SECTION 1

### **INTRODUCTION/SUMMARY**

1.1 Name and address of the licensee or owner of the site:

U.S. Army Soldier and Biological Chemical Command  
ATTN: AMSSB-RCB-RS  
5183 Blackhawk Road  
Aberdeen Proving Ground, MD 21010-5424

1.2 Location and address of the site:

Site information:	Local reporting activity:
Department of the Army	Newport Chemical Activity
U.S. Army	ATTN: SCBNE-CO
Jefferson Proving Ground	P.O. Box 121
Madison, IN 47250	Newport, IN 47966

1.3 Description of the site and immediate environs. Jefferson Proving Ground (JPG) is located in southeastern Indiana within parts of Jefferson, Ripley, and Jennings counties. The installation is rectangular in shape, approximately 18 miles long (north to south) and 5 miles wide (east to west). Major metropolitan areas include Louisville, Kentucky, approximately 45 miles southwest; Cincinnati, Ohio, approximately 75 miles northeast; and Indianapolis, Indiana approximately 85 miles north/northwest. Madison, Indiana, the closest major city, is approximately five miles south of JPG. The lands surrounding JPG are primarily farmlands, woodlands and rural residential. The topography of JPG is flat to rolling with most relief due to stream incision.

1.4 Summary of licensed activities that occurred at the site, the number and type of license(s); when the facility began and ceased using licensed material and the types and activities of licensed material authorized and used under the license(s): The JPG License number of concern is SUB-1435 (refer to Appendix E). It allowed for the production acceptance testing of munitions that contained depleted uranium (DU). This program was used to track firing, flight and trajectory-accuracy of kinetic energy weapons. There was no machining or processing of DU at post facilities. These test activities commenced in the mid 1980s and terminated in September 1994. The Base Realignment and Closure

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(BRAC) Commission, established by the Secretary of Defense in May 1988, recommended the closure of JPG. This was mandated by Public Law 100-526 on 24 October 1988. In a letter dated 29 August 1994, an amendment to the JPG license was requested for possession of DU only (no other radionuclides were listed). JPG closed at the end of September 1995.

1.5 Nature and extent of contamination at the site: The nature of the contamination is uranium metal and oxides formed by weathering of metallic particles from DU contained in tank penetrator fragments. The DU Impact Area consists of approximately 2,000 acres within the 51,000 acre area north of the firing line. Within the 51,000 acres there are an estimated 1.5 million rounds of unexploded ordnance. The 2,000 acre DU Impact Area contains approximately 70,000 kilograms of DU and one of the largest concentrations of unexploded ordnance (UXO) at the site.

1.6 Decommissioning objective proposed by the licensee is: restricted use governed by institutional controls. Refer to Section 7, ALARA Analysis, for a detailed cost/benefit analysis.

1.7 Derived Concentration Guideline Levels (DCGLs) for the site:, DCGLs, referred to as release criteria, were established in the U.S. Nuclear Regulatory Commission (NRC) approved Environmental Radiation Monitoring Plan<sup>1</sup> (ERM). Efforts were made to maintain radiation exposures and releases As Low As Is Reasonably Achievable (ALARA) pursuant to 10 CFR 20.

SAMPLE MATRIX	LOCATION	RELEASE CRITERIA
SOIL	Perimeter and background	35 pCi/g
	Along lines of fire	100 pCi/g
WATER	All locations	0.15 pCi/ml

1.8 Summary of the ALARA evaluations performed: The estimated cost to remediate the DU (and UXO) area is on the order of hundreds of millions of dollars<sup>2</sup>. The cost of DU removal/remediation ranges to 6000 times greater than the present benefit of collective dose averted. Remediation of DU is not cost

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<sup>1</sup> U.S. Army Test and Evaluation Command, 12 July 1996, Environmental Radiation Monitoring Plan (ERM) at Jefferson Proving Ground (JPG).

<sup>2</sup> Final Study, Cleanup and Reuse Options, Contract No. DAAA09-92-C-0330, U.S. Army Jefferson Proving Ground, 15 October 1992, Mason and Hanger, Battelle Memorial Institute, Automation Research Systems, Limited.

effective with present technology. A management commitment has been made to maintain radiation exposures to workers and the public ALARA. This commitment is reflected in site orientation training for entering the natural resource area, restrictions for entering the former firing area, and the required action of anyone who finds ordnance. (The appropriate action for finding ordnance is to keep hands-off, leave it in place, and report location to the main office). The primary safety concern is potential hazards from UXO. Throughout the license termination process, ALARA engineering and administrative controls will be evaluated and utilized to minimize collective and individual radiation exposures. Refer to Section 7 for a detailed evaluation.

1.9 Restrictions to limit doses (10 CFR Part 20.1403) and a summary of institutional controls and financial assurance: A facility perimeter fence with "No Trespassing" signs and inner locked-access road gates are in place and maintained to control access to the DU area and DU impact area. The DU Impact Area perimeter is identified as a restricted access area and includes "Caution - Radioactive Material" postings. In addition, key access for the locked barricades on access roads to the DU Impact Area is controlled in accordance with (IAW) the Memorandum of Agreement (MOA) (Refer to Appendix B). Key access is limited to authorized personnel, and quarterly lock and key inventories will be made of all issued keys. An environmental monitoring program was conducted to evaluate uranium concentration in soil, sediment, groundwater and surface water. Orientation training is required for JPG workers, visitors and users and local law enforcement agencies (see Appendix B). JPG staff and local law enforcement agencies may routinely patrol the perimeter and should report any unusual or suspect activity. Financial assurance is addressed via a Statement of Intent in Section 15.

1.10 Summary of public participation activities undertaken to comply with 10 CFR Part 20.1403(d): Public participation will be encouraged throughout the license termination process. Information will be maintained and available at the Madison City Library in Madison, IN and the Hanover College Library in Hanover, IN. Jefferson Proving Ground has a website available at <http://jpg.sbcom.army.mil>. The licensee staffs JPG with a U.S. Army site team at Building 125 whose function is to monitor all activity on the installation and keep headquarters informed of all developments.

1.10.1 The JPG Restoration Advisory Board (RAB) meets periodically. The RAB is intended to represent a wide spectrum and cross-section of the local community. The RAB is the mechanism provided by the U.S. Army (DA) for community participation and input regarding issues that may be affected by license termination activities. The goal of the RAB is to ensure that the concerns of the community are identified and addressed to the extent possible through public participation. RAB meetings are published, and the public is notified through a mailing list, public notices, and summaries of public meetings. Verbatim minutes of all RAB meetings are provided to all RAB members and available in the JPG Administrative Record maintained at Hanover College, Hanover, IN.

1.10.2 Save The Valley (STV) is a non-profit volunteer organization which represents environmental and public interest matters in the Ohio River Valley between Lawrenceburg, IN, and Louisville, KY. The RAB notifies STV of periodic meetings in order to ensure public participation and input. STV maintains a website at <http://www.oldmadison.com/stv>.

1.11 Proposed initiation and completion dates of license termination: The installation ceased test activity on September 30, 1994 and closed on 29 September 1995. The license termination process is anticipated to encompass a period from the submittal of this plan (anticipated to be in calendar year 2001) and three years out (calendar year 2004).

1.12 Post remediation activities (such as groundwater monitoring) undertaken prior to requesting license termination: Although no DU remediation took place or is planned, surface and groundwater monitoring and soil and sediment monitoring were conducted IAW References 3<sup>3</sup> and 4<sup>4</sup>. No DU remediation was or is planned at the site because the dose estimation did not or does not justify any further action and the UXO was and is a prohibitive factor because of safety and cost reasons. Environmental monitoring will be continued until approval of the

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<sup>3</sup> U.S. Army Center for Health Promotion and Preventive Medicine Standing Operating Procedure, 10 March 2000, Depleted Uranium Sampling Program Environmental Radiation Monitoring Program, Jefferson Proving Ground, Madison, IN.

<sup>4</sup> U.S. Army Test and Evaluation Command, 12 July 1996, Environmental Radiation Monitoring Plan (ERM) at Jefferson Proving Ground (JPG).

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termination of the license. Upon license termination  
environmental monitoring will cease and the institutional  
controls will be implemented.

1.13 Statement that the licensee is requesting that its license  
be amended to incorporate the decommissioning plan: Amendment 10  
of License SUB-1435 entails decommissioning at JPG, refer to  
Appendix E.

## SECTION 2

### **FACILITY OPERATING HISTORY**

#### 2.1 License Number/Status/Authorized Activities.

2.1.1 Radionuclide(s) and maximum amount authorized and used: As authorized by NRC Materials License Number SUB-1435:

Radioactive Material	Chemical and/or Physical Form	Maximum Amount that Licensee May Possess
Uranium	Depleted uranium metal, alloy, and/or other forms	80,000 kilograms

2.1.2 Chemical form(s) of radionuclide(s) authorized and used under the current license: Depleted uranium metal, alloy, and/or other forms.

2.1.3 Detailed description of how the radionuclide(s) are currently being used: Authorized use is for possession only for license termination. The licensed material is located in the area north of the firing line, primarily in the Depleted Uranium Impact Area as DU penetrators and fragments.

2.1.4 The location of use and storage of radionuclide(s) authorized under the current license: The licensed material shall be kept onsite, for the purpose of license termination, in the restricted area known as DU Impact Area. This area is located north of the firing line.

2.1.5 A scale map of the site and environs showing the current locations of radionuclide use: Possession is authorized for the DU Impact Area. (Refer to Appendix C, Map 2).

2.1.6 Amendments to the license since the last license renewal: Amendment 10 is in effect. (Refer to Appendix E).

#### 2.2 License History.

2.2.1 Radionuclides and maximum activities authorized: License SUB-1435 was limited to 80,000 kilograms of DU. All other licenses have been terminated or are no longer applicable to JPG.

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2.2.2 Chemical form of radionuclide: Depleted uranium, metal, alloy and/or other forms.

2.2.3 Detailed description of how the radionuclides were used at the site: From the mid 1980s until 1994, accuracy testing of DU, the only radioactive material of concern for the License Termination Plan (LTP), in large caliber penetrator rounds was conducted at the JPG.

2.2.4 The locations of use and storage of the various radionuclides authorized under all previous licenses: Previous use did not affect the DU Impact Area. Previous use and storage is summarized in Reference 6<sup>5</sup>. NRC License Number 13-12416-01, for the use of scandium-46, was terminated in 1993. Other radionuclides were used under a general Army-wide license.

2.2.5 A scale drawing of the site area showing the previous locations of radionuclide use at the site: Refer to Appendix C, Map 3. The areas of previous use of concern were limited to Buildings 186, 205, 216, 223, and 227. (The map also identifies current use of Buildings, where appropriate). Note that the current licensed area, the DU Impact Area, was not affected by these previous operations.

2.3 Previous Decommissioning Activities. No previous remediation activity has occurred in the DU Impact Area. (While no formal remediation activity was conducted in the area north of the firing line, periodic retrieval of surface penetrators and fragments was conducted up to the time the facility was closed. Retrieved items were recycled).

2.4 Spills<sup>5</sup>. There is no historical or anecdotal evidence of spills or uncontrolled releases of licensed material in the DU Impact Area.

2.5 Prior on-site burials<sup>5</sup>. There is no historical or anecdotal evidence of on-site burial of licensed material within the DU Impact Area.

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5 Industrial Radiation Historical Data Review No. 27-83-3888-95, U.S. Army Jefferson Proving Ground, Madison, IN, 12-14 June 1995.

### **SECTION 3**

#### **FACILITY DESCRIPTION**

##### **3.1 Site Location and Description.**

3.1.1 JPG is approximately 55,000 acres in area. There are approximately 51,000 acres north of the firing line and 4,000 acres south of the firing line. The DU Impact Area consists of approximately 2,000 acres within the 51,000 acre area north of the firing line.

3.1.2 The site is located in the State of Indiana within parts of north central Jefferson, southwestern Ripley, and southeastern Jennings counties. Refer to Appendix C, Map 1.

3.1.3 The nearest towns, communities and cities are:

Town/Community/City	Distance (miles)	Direction from site
Madison, IN	5	South
Louisville, KY	45	Southwest
Cincinnati, OH	75	Northeast
Indianapolis, IN	85	North/Northwest

3.1.4 The contours and features of the site are flat to gently rolling farmlands and woodlands. Most relief is due to stream incision.

3.1.5 The site is approximately 850 to 930 feet above mean sea level.

3.1.6 The site is primarily undeveloped and unimproved. Man-made features are limited. There is a road system suitable for off-road vehicles. A fence system is maintained around the perimeter of the area north of the firing line. A barricade system is maintained for the DU Impact Area. Several historic structures stand north of the firing line: Oakdale Schoolhouse, Old Timbers Lodge and four stone-arch bridges.

3.1.7 The property surrounding the site is predominantly farmlands, woodlands, and rural residential areas. Public water from a municipal system or deep wells is used by nearby communities or individuals.

3.1.8 Prominent water pathways on site are Big Creek, Graham Creek, Otter Creek, Harberts Creek, and several smaller creeks which are sub-basins of the Muscatatuck River, White River, and the Ohio River. Surface water drainage is generally from the northeast to the west and southwest. Old Timbers Lake, a man-made lake from the impoundment of Little Otter Creek, is the primary lake. Old Timber's Lake runs generally north to south and is located in the northeast portion of JPG. Krueger Lake, located in the southeastern corner of JPG, is a result of the impoundment of Harbert's Creek. Several smaller ponds are on the site. Refer to Appendix C, Map 4.

3.1.8 Detailed topography, locations of monitoring wells and sample points is summarized as follows: Refer to Appendix C, Map 5 for location.

Well	Sample Location
MW01	Southeast corner intersection of D-Road and Wonju Road (DU area east perimeter)
MW02	West side of Wonju Road, 1.1 mile north of A Road (DU area east perimeter)
MW03	East side of Wonju Road, 0.3 mile south of A Road (DU area east perimeter)
MW04	On South Perimeter Rd. (Southeast corner of JPG)
MW05	East side of Morgan Road, 0.1 mile south of Big Creek Bridge (No.13) (DU area west perimeter)
MW06	West side of Morgan Road, 0.4 mile south of C Road intersection (DU area west perimeter)
MW07	West side of Morgan Road at Oakdale Schoolhouse
MW08	South Perimeter Road (southwest corner of JPG)
MW09	North side of D Road, 0.2 mile east of Center Recovery Road intersection, directly north of Bridge No.22 (within DU range)
MW10	West side of Center Recovery Road, 0.5 mile north of D Road intersection (within DU range)
MW11	North side D-Road, 0.3 mile east of Morgan Road intersection (within DU range)

3.1.10 Location of the nearest residences and all significant facilities or activities near the site: there is an estimated population of 100 persons residing approximately one kilometer south of the firing line. The nearest community is Madison, IN. Current actions for areas south of the firing line include: Jefferson County, IN, uses about 200 acres as park land, the State of Indiana uses two buildings as a recycling center, the Madison, IN, Port Authority has purchased a building (Building 216) to house a train engine and some 17 miles of

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railroad right of way, the State of Indiana owns nine buildings and approximately 36 acres as a highway maintenance facility and the lease of the remainder of the cantonment area to a private citizen from Dupont, IN. Anticipated actions include the transfer of the cantonment area to a private citizen from Dupont, IN, subsequent to environmental restoration.

3.1.11. A description of the facilities at the site: Productive reuse of JPG in accordance with sound environmental principles is the ultimate goal of JPG closure. A site management team and the U.S Fish and Wildlife Service have field offices at the site. Areas north of the firing line are used for Air National Guard training and as a wildlife refuge.

### 3.2 Population distribution.

3.2.1 A summary of current population is:

Current Population	Community	Compass Vector
31,813	Jefferson County(1)	NA
12,006	Madison, IN(2)	South
28,106	Jennings County(1)	NA
27,660	Ripley County(1)	NA
100	Installation	NA
0	DU Impact Area	NA
(1). Based on U.S. Census estimates for 1 July 1999 (CO-99-2)		
(2). Based on U.S. Census 1990 data		

3.2.2 Population is projected to remain relatively stable for the immediate JPG vicinity. Population growth rate estimates are less than one percent annually.

3.2.3 A list of minority populations by compass vectors:

Minority (non-white) Population/Percent	Community	Compass Vector
685/2.18	Jefferson County	NA
Within Jefferson County	Madison, IN	South
390/1.40	Jennings County	NA
122/0.45	Ripley County	NA
Not available	Installation	NA
0/0	Impact Area	NA

3.2.4 Demographic data by census block group to identify minority or low-income populations:

Poverty Statistic(1)	Community	Estimate/Percent
People of all ages	Jennings County	2640/9.9
People under age 18		1042/14.4
Related Children age 5-17		656/12.6
People of all ages	Jefferson County	3197/10.7
People under age 18		1183/15.4
Related Children age 5-17		765/13.6
People of all ages	Ripley County	2711/10.0
People under age 18		1118/14.5
Related Children age 5-17		828/14.6
(1) Based on U.S. Census estimates for July 1996		

3.3 Current/Future Land Use.

3.3.1 Current land uses of surrounding lands are farmland, woodland and rural residential. The intended use of JPG north of the firing line is for a protected and managed wildlife habitat (the Big Oaks National Wildlife Refuge was dedicated on 8 July 2000) administered by the U.S. Fish and Wildlife Service (USFWS) and the U.S. Air Force (USAF)/Indiana Air National Guard as an air to ground training range IAW the MOA (Refer to Appendix B). Intended use of the area south of the firing line is for transfer to a private citizen from Dupont, IN, subsequent to environmental restoration.

3.3.2 Future land uses are anticipated to remain the same for the foreseeable future.

3.4 Meteorology and Climatology.

3.4.1 General climate of the region: The climate of southeastern Indiana is variable due to the characteristic path of the low and high pressure systems affecting the area and the occasional mixing of warm, moist air from the Gulf of Mexico. Precipitation is categorized as non-seasonal and varies from year to year. The fall months are usually driest. The wettest month is typically May. The heaviest precipitation totals as well as the rains of the longest duration are associated with low-pressure systems that primarily move southwest to northeast through the Ohio Valley. Snowfall usually occurs from November

through March. Snowfall amounts vary annually and monthly. Seasonal temperature extremes vary from 100 degrees Fahrenheit (°F) or higher in the summer to 0 °F or lower in the winter. The typical last date of freezing temperature is late April and the typical onset of freezing temperature is late October. Average annual temperature is 54 °F.

3.4.2 Seasonal and annual frequencies of severe weather phenomena: Thunderstorms occurring as separate air mass cells or squall lines or widespread storms with high rainfall intensities and damaging winds are common during spring and summer months.

3.4.3 Weather-related radionuclide transmission parameters: Prevailing direction for surface winds is southerly with an average velocity of under ten miles per hour. Heavy fog, which could result in ground deposition of airborne radionuclides, occurs about 18 days annually.

3.4.4 Routine weather-related site deterioration parameters including precipitation intensity and duration, wind vectors, and temperature and pressure gradients: Parameters vary seasonally.

3.4.5 Extreme weather-related site deterioration parameters including tornados, water spouts, thunderstorms, hail, and extreme air pollution (from offsite sources): Southeastern Indiana is near the eastern boundary of "tornado alley". As such, JPG is occasionally subject to tornados during spring and summer months. Thunderstorms are common in spring and summer months. Air quality is generally good. Extreme air pollution from offsite sources is not a contributing factor to site air quality.

3.4.6 A description of the local (site) meteorology: Ranges or averages from the Madison, IN weather station data (1961-1990) are summarized as follows:

Temperature (°F)	Water Vapor	Precipitation (inches)	Fog (days)	Atmospheric Stability	Air Quality
44.2 to 64.9	Varies	43.85	18	Varies	Acceptable

3.4.7 The National Ambient Air Quality Standards Category of the area is "attainment area". An area may be an "attainment area" which is acceptable ambient air quality or "non-attainment area" which is unacceptable ambient air quality. Levels for

criteria pollutants are acceptable for the JPG region of Indiana. JPG lies within State of Indiana Office of Air Management, Indiana Department of Environmental Management air quality control region 083. This region was verified to be in compliance with air quality standards through the Office of Air Management [Commercial phone: (317) 233-0178]. Parameters monitored are criteria pollutants; particulates, nitrogen dioxide, sulfur dioxide, carbon monoxide, lead and ozone. Activity within the DU Impact Area does not adversely impact site or regional ambient air quality.

3.5 Geology and Seismology. JPG is on the western extension of a plunging anticline, the Cincinnati Arch. The site is within the Till Plains section of the Central Lowlands Province. Characteristics include till deposits capping a rolling limestone plateau with deep drainage cuts. JPG is underlain with deposits of windblown nonstratified silts and clays and further underlain by glacial till. Bedrock is characterized by thick layers of interbedded carbonate.<sup>6</sup> Since Indiana is in the middle of the continent it is relatively stable. The tectonic setting of Indiana has remained relatively stable for the last 650 million years as evidenced by relatively flat and undisturbed rocks. There are known karst formations within the JPG property boundaries, particularly north of the firing line and within the DU Impact Area. Historical earthquakes that have a magnitude of three or more within 200 miles of the site are as follows:

Date	Epicenter	Depth	Magnitude
13 April 00 at 10:54 PM CDT	15 miles (20 kilometers (km)) SSE of Crawfordsville, IN UTC 39.86N, 86.72W	5 km	3.6
9 November 1968	Dale, IL	Unknown	5.3
29 April 1899	Strongest at Shelbyville, IN and Jeffersonville, IN	Unknown	VI - VII on modified Mercalli scale

### 3.6 Surface Water Hydrology.

3.6.1 A description of the site drainage and surrounding fluvial features, including important water uses: Site drainage for the site stream corridors is primarily from the northeast to the west and southwest. Drainage for the creeks is well developed and usually consists of numerous tributaries<sup>6</sup>. Stream incision is the primary relief on the site and can be extreme.

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<sup>6</sup> Department of the Army, Final Environmental Impact Statement, September 1995, Disposal and Reuse of the Jefferson Proving Ground, Madison, Indiana.

Seasonal variations in stream level can be extreme. The impoundment of Little Otter Creek and Harbert's Creek formed Old Timber's Lake and Krueger Lake, respectively. Both are used for recreational purposes. There is no significant commercial value associated with the water bodies.

3.6.2 Water resource data: Conservative default parameters were used for dose modeling. Refer to Appendix F.

3.6.3 Topographic map of the site that shows natural drainage and man-made features: Refer to Appendix C, Map 5.

3.6.4 A description of the surface water bodies at the site and surrounding areas, including the location, size, shape, and other hydrologic characteristics of streams, lakes, or coastal areas: The principal surface body of water is Old Timbers Lake in the northeast corner of the site at 165 acres. Krueger Lake is in the southeast portion of the site and has an area of eight acres. Several smaller ponds and impoundments are also present.

3.6.5 A description of existing and proposed water control structures or diversions (both upstream and downstream) that may influence the site: Existing water control structures are Little Otter Dam on Little Otter Creek which forms Old Timber's Lake and a dam on Harbert's Creek to form Krueger Lake. No other man-made water control structures are anticipated for the site. It has been noted that a growing beaver population has led to the creation of significant acreage of ponds and marsh areas, some within the DU Impact Area. This trend is expected to continue.

3.6.6 Flow-duration data for surface water bodies in the area: Peak flow occurs in the springtime reducing through summer and fall. Typical flow rate ranged from 25-50 cubic feet per second.

3.6.7 Map of the site and adjacent drainage areas identifying features such as drainage areas, surface gradients, and areas of flooding: Refer to Appendix C, Map 5. The site is generally well drained. Seasonal high water can occur.

3.6.8 An inventory (to include owner, location, type, and amount of use; source of supply; type of intake; and surface water quality) of all existing and planned surface water users, whose intakes could be adversely affected by migration of

radionuclides from the site: The water at JPG is considered non-potable<sup>7</sup>. Public water from the city of Madison, IN, is used. Users of surface water would be limited to recreational users. Environmental monitoring of surface water was conducted twice annually to determine whether DU contaminants were migrating outside the installation controlled area.

3.6.9 Topographic map and/or aerial photographs that delineate the 100-year floodplain: JPG is not within a 100 year floodplain.

3.6.10 A description of any man-made changes to the surface water hydrologic system that may influence the potential for flooding: There is little impact to the natural hydrologic system. Nearby off-post urban development and strip mining are limited. There is no commercial activity in the area north of the firing line that would greatly influence the flood potential.

### 3.7 Groundwater Hydrology.

3.7.1 Where appropriate, conservative default parameters were used for dose modeling and the saturated zone parameters, including, but not limited to potentially affected aquifers, the lateral extent, thickness, water-transmitting properties, recharge and discharge zones, groundwater flow directions and velocities, and other information that can be used to create an adequate conceptual model. Refer to Appendix F.

3.7.2 Descriptions for monitor wells, including location, elevation, screened intervals, depths, construction and completion details, and hydrogeologic units monitored. The description should include domestic, industrial and/or municipal wells or other monitoring devices, if applicable, and any construction and completion details for these devices, when available. A series of DU monitoring wells is present at JPG area north of the firing line. Refer to Appendix C, Map 5.

Location	Screened intervals	Depth (feet)
MW1	0.006 inch slot PVC screen 33.2 to 28.4 feet	33.2
	0.006 inch slot PVC screen 13.1 to 8.3 feet	
MW2	0.006 inch slot PVC screen 23.7 to 13.7 feet	23.7

<sup>7</sup> JPG Final Draft Remedial Investigation Volume 1, Rust Environment and Infrastructure, July 1994.

MW3	0.006 inch slot PVC screen 42.8 to 32.8 feet	42.8
MW4	0.006 inch slot PVC screen 28.5 to 23.0 feet 0.006 inch slot PVC screen 13.5 to 8.5 feet	28.5
MW5	0.006 inch slot PVC screen 33.4 to 23.4 feet	33.4
MW6	0.006 inch slot PVC screen 40.0 to 30.0 feet	40.0
MW7	0.006 inch slot PVC screen 53.7 to 43.7 feet	53.7
MW8	0.006 inch slot PVC screen 28.2 to 18.2 feet	28.2
MW9	38.2 to 18.2 feet	38.2
MW10	41.3 to 21.3 feet	41.3
MW11	41.9 to 11.9 feet	41.9

3.7.3 Physical parameters: For glacial tills groundwater movement is slow due to low hydraulic conductivity ( $2.89 \times 10^{-5}$  to  $8.40 \times 10^{-5}$  cm/sec) and relatively flat hydraulic gradients. Small scale fracturing (typically 10 mm) and large scale fracturing (20 mm to over 630 mm) have been identified for typical JPG glacial tills. Typical threshold gradient is 0.07. For limestones and dolomites groundwater movement hydraulic conductivity ranged from  $3.3 \times 10^{-6}$  to  $1.14 \times 10^{-3}$  cm/sec.

3.7.4 Groundwater flow is roughly in the same direction as the surface water drainage (toward the west and southwest) since the underlying ground layers roughly follow the surface contours. Rate of movement is slow due to the low hydraulic conductivity of the underlying ground deposits.

3.7.5 Where appropriate, conservative default parameters were used for dose modeling and used for the unsaturated zone including the lateral extent and thickness of permeable and impermeable zones, potential conduits of anomalously high flux, and direction and velocity of unsaturated flow. Refer to Appendix F.

3.7.6 Information on all monitor stations including location and depth may be found in Section 3.7.2 and Appendix C, Map 5.

3.7.7 Where appropriate, conservative default parameters were used for dose modeling and used for physical parameters including the spatial and stratigraphic distribution of the total and effective porosity; water content variations with time; saturated hydraulic conductivity; characteristic relationships between water content, pressure head, and hydraulic conductivity; and hysteretic behavior during wetting and drying cycles. Refer to Appendix F.

3.7.8 Where appropriate, conservative default parameters were used for dose modeling and used for numerical analyses techniques used to characterize the unsaturated and saturated zones including the model type, justification, documentation, verification, calibration and other associated information. In addition, the description should include the input data, data generation or reduction techniques, and any modifications to these data. Refer to Appendix F.

3.7.9 Where appropriate, conservative default parameters were used for dose modeling and used for distribution coefficient for uranium. Refer to Appendix F.

3.8 Natural Resources. (Note: this information included to provide site characterization. The license termination process is focused on human health).

3.8.1 Natural resources occurring at or near the site: The site is approximately 75 per cent forested, primarily with hardwoods, and, to a lesser extent, coniferous trees. There is a variety of animal species. Hunting and fishing is permitted on selected areas north of the firing line but not in the DU Impact Area.

3.8.2 A description of potable, agricultural, or industrial ground or surface waters including information on resource type, occurrence, location, extent, net worth, recoverability, and current and projected use: Water used at the site is supplied by the Madison, IN municipal water supply system for areas south of the firing line and by other municipal water supply system(s) (i.e., Canaan Water Company) for areas off of the facility but north of the firing line. No drinking water wells or municipally supplied water is available north of the firing line on the facility.

3.8.3 A description of economic, marginally economic, or sub-economic known or identified natural resources: Fish and game. Any potential future exploitation of natural resources that would cause disruption is not anticipated. DU remediation considerations are limited, primarily due to UXO remediation costs and personnel safety during UXO clearing operations. The area north of the firing line (specifically the DU Impact Area) is part of a National Wildlife Refuge and not expected to have

its natural resources developed.

3.8.4 Mineral, fuel, and hydrocarbon resources near and surrounding the site which, if exploited, would effect dose estimates: Any potential future exploitation of mineral, fuel, and hydrocarbon resources that would impact dose estimates is not anticipated.

3.9 Ecology/Endangered Species. (Note: This information included to provide site characterization. The license termination process is focused on human health).

3.9.1 A list of commercially or recreationally important invertebrate species known to occur within five kilometers of the site: None.

3.9.2 A list of all commercially important floral species known to occur within 5 km of the site: White oak, black walnut.

3.9.3 A list of commercially or recreationally important vertebrate animals known to occur within 5 km of the site: Whitetail deer, wild turkey, cottontail rabbit, wood duck, fox squirrel and eastern gray squirrel. Various indigenous and stocked fish, such as bass, bluegill, and catfish also occur.

3.9.4 Estimates of the relative abundance of both commercially and recreationally important game and nongame vertebrates: Whitetail deer harvests are estimated to be 500 to 850 annually.

3.9.5 A list of all endangered species at or within 5 km of the site: Endangered species as summarized by the Indiana Department of Natural Resources for the counties in which the JPG is located is as follows:

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Name	County	Watch list
Vascular Plants		
Silky Dogwood	Jefferson	State
Swamp Sunflower	Jefferson	State
American Water-Pennywort	Jefferson	State
Broom Panic-Grass	Jefferson	State
Pursh Buttercup	Jefferson	State
Maryland Meadow Beauty	Jefferson	State
Weakstalk Bulrush	Jefferson/Ripley	State
Virginia Mallow	Jefferson	State
Running Buffalo Clover	Jefferson	State/Federal
Elliptical Rushfoil	Jennings/Ripley	State
Divided Toothwort	Jennings	State
Northern Bog Clubmoss	Jennings/Ripley	State
Climbing Fern	Jennings/Ripley	State
Thread-like Naiad	Jennings	State
Clingman Hedge-Nettle	Jennings	State
Illinois Blackberry	Ripley	State
Hypericum Gynmanthum	Ripley	State
Mussels		
Snuffbox and Sheepnose	Jefferson	State
Birds		
Name	County	Watch list
Bachman's Sparrow	Ripley/Jefferson	State
King Rail	Ripley/Jennings	State
Henslow's Sparrow	Jennings/Jefferson	State
Sedge Wren and Least Bittern	Jennings	State
Yellow Crowned Night Heron	Jennings	State
Osprey	Jennings	State
Loggerhead Shrike	Jefferson	State
Barn Owl	Jefferson	State
Name	County	Watch list
Mammals		
Northern River Otter	Ripley	State
Bobcat	Ripley/Jefferson	State
American Badger	Ripley/Jennings/Jefferson	State
Least Weasel	Jennings	State
Gray Bat	Jennings	State/Federal
Indian Bat or Social Myotis	Ripley/Jennings/Jefferson	State/Federal
Evening Bat	Jennings	State
Beetles		
Cave Beetle	Jefferson/Jennings	State
Amphibians		
Hellbender	Jefferson	State
Reptiles and Arthropods		
Kirtland's Snake	Jefferson/Jennings	State
Southeastern Crowned Snake	Jefferson	State
Pseudoscorpion	Jennings	State
Cave Spider	Jennings	State

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#### **SECTION 4**

##### **RADIOLOGICAL STATUS OF FACILITY**

NOTE: It was determined that this section is not required for the scope of the intended license termination process as no remediation evolutions are anticipated.

## **SECTION 5**

### **DOSE MODELING EVALUATIONS**

5.1 Unrestricted release using screening criteria. It was determined that this section is not required for the intended license termination process. The license termination plan is intended for restricted release governed by institutional controls.

5.2 Unrestricted release using site-specific information. It was determined that this section is not required for the intended license termination process. The license termination plan is intended for restricted release governed by institutional controls.

5.3 Restricted release using site-specific information. Dose modeling assumptions, data, parameters and conclusions are presented in Appendix F.

5.4 Alternate release criteria. It was determined that this section is not required for the intended license termination process. The license termination plan is not intended to cover alternate release criteria.

## **SECTION 6**

### **ALTERNATIVES CONSIDERED AND RATIONALE FOR CHOSEN ALTERNATIVE**

6.1 Alternatives Considered. Three basic options were considered for the fate of the DU Impact Area: 1) take no action, 2) remediate DU, and 3) allow restricted use.

6.2 Rationale for chosen alternative. The restricted use scenario was chosen as the most viable alternative primarily for personnel safety concerns due to the presence of UXO and associated costs for remediation. Further, the cost benefit for dose averted exceeded the cost for DU remediation. This alternative was evaluated pursuant to 10 CFR 20 ALARA philosophy. A detailed evaluation is contained in Section 7, ALARA Analysis.

## **SECTION 7**

### **ALARA ANALYSIS**

7.1 A description of how to achieve a license termination goal below the dose limit: "Reasonably Achievable" is judged by considering the state of technology and the economics of improvements in relation to all the benefits from these improvements. In the case of JPG, technology is not to the point that the DU Impact Area can be remediated to unrestricted conditions in the presence of UXO. The UXO is of primary concern due to the potential personnel safety hazards. As demonstrated in NUREG-1727<sup>9</sup>, the preferred method of compliance for JPG is to demonstrate that remediation to unrestricted release criteria is beyond consideration due to the extremely high costs of DU (and UXO) remediation as estimated by Mason and Hanger<sup>8</sup>. In this case, the estimate of benefit, to include costs that would be avoided if the site were to be released for unrestricted use, including calculation of site control and maintenance costs, are far outweighed by the cost of DU remediation.

7.2 A quantitative cost benefit analysis: SBCCOM is seeking to terminate NRC License SUB-1435 under restricted release. Using actual cost estimates for remediation of the area north of the firing line, the total costs for cleanup and remediation of DU (and UXO within the DU Impact Area) was \$715,070,370<sup>8</sup>.

7.3. A description of how costs were estimated: Methods set forth in NUREG-1727<sup>9</sup>, Appendix D were used to estimate the desired beneficial effects of remediation of DU (and UXO within the DU Impact Area) versus the undesirable costs of the action was used.

7.3.1 The calculation of cost-benefit, the benefit estimated from a reduction in the residual radioactivity, is the monetary value of the collective averted dose to future occupants of the site. Equation 7-1 (from NUREG-1727<sup>9</sup> equation D8) was implemented to demonstrate that the cost to remediate far exceeds

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<sup>8</sup> Final Study, Cleanup and Reuse Options, Contract No. DAAA09-92-C-0330, U.S. Army Jefferson Proving Ground, 15 October 1992, Mason and Hanger, Battelle Memorial Institute, Automation Research Systems, Limited.

<sup>9</sup> NUREG-1727, NMSS Decommissioning Standard Review Plan, U.S. Nuclear Regulatory Commission Office of Nuclear Material Safety and Safeguards, September 2000.

the benefit of remediating the DU (and UXO within the DU Impact Area) remaining in the DU Impact Area. The DU Impact Area was evaluated using the resident farmer scenario. The resident farmer scenario was selected as the most prudently conservative, yet most unrealistic, as the land area in question also contains large quantities of UXO. Additionally, the dose used in the computation was the accepted 25 millirem per year (mrem/yr) (0.025 rem/yr) which is typically used in unrestricted release conditions.

Equation 7-1: (from Appendix D, NUREG-1727, Equation D8)

$$\frac{Conc}{DCGL_W} = \frac{Cost_t}{2000 \times P_D \times 0.025 \times F \times A} \times \frac{r + \lambda}{1 - e^{-(r + \lambda)N}}$$

WHERE:

PARAMETER	DESCRIPTION/UNIT	VALUE	REFERENCE
Cost <sub>t</sub>	Total cost (sum of costs as calculated for applicable parameters) (\$)	Derived below	(a)
2000	Value of person-rem averted (\$/person-rem)	2000	(b)
P <sub>D</sub>	Population density of critical group (people/m <sup>2</sup> )	3E-5	(c)
0.025	Annual Dose to an average member of the critical group from residual radioactivity at the DCGL <sub>W</sub> concentration (rem/yr) (25 mrem/yr)	0.025	(a)
F	Fraction of residual radioactivity removed by DU remediation action	0.5 or unity(1)	(d)
A	Area being evaluated (m <sup>2</sup> ) (5.576E7 ft <sup>2</sup> X 0.093 m <sup>2</sup> /ft <sup>2</sup> = 5.19E6 m <sup>2</sup> )	5.19E6	(d)
R	Monetary discount rate (yr <sup>-1</sup> )	0.03	(b)
λ	Radioactive decay constant for U-238 (yr <sup>-1</sup> ) Where: λ=0.693/half-life U-238 =0.693/4.468E9 yr = 1.55E-10 yr <sup>-1</sup>	1.55E-10	(Chart Of Nuclides/derived)
N	Number of years over which the collective dose will be calculated (yr)	1000 (soil)	(b)
Note: (a) NUREG-1727, Equation D3 (b) NUREG-1727, Table D2 (c) US Census Bureau via <a href="http://quickfacts.census.gov">http://quickfacts.census.gov</a> (d) Mason and Hanger report Table G-2 (1 is no remedial actions)			

Equation 7-2 (from NUREG-1727, Equation D3):

$$Cost_T = Cost_{ACC} + Cost_{TF} + Cost_{WDose} + Cost_{PDose} + Cost_X$$

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WHERE:

The cost of non-radiological workplace accidents, $Cost_{ACC}$ , (from NUREG-1727, Equation D5): $Cost_{ACC} = \$3,000,000 \times F_W \times T_A$			
PARAMETER	DESCRIPTION/UNIT	VALUE	REFERENCE
3,000,000	Monetary value of a fatality equivalent to \$2000 per person-rem (\$)	3E6	(a)
$F_W$	Workplace accident fatality rate (Fatalities/hours worked)	4.2E-8	(b)
$T_A$	Worker time required for remediation (hr)	4E4	(c)
Note: (a) NUREG-1727, Equation D5 (b) NUREG-1727, Table D2 (c) Mason and Hanger report Figure G-2			
$Cost_{ACC} = \$3E6 \times 4.2E-8 \times 4E4 = \$5040$			

AND WHERE:

The cost of traffic fatalities incurred during the transportation of waste, $Cost_{TF}$ , (from NUREG-1727, Equation D6): $Cost_{TF} = \$3,000,000 \times (V_A/V_{SHIP}) \times F_T \times D_T$			
PARAMETER	DESCRIPTION/UNIT	VALUE	REFERENCE
3,000,000	Monetary value of a fatality equivalent to \$2000 per person-rem (\$)	3E6	(a)
$V_A$	Volume of waste produced (yd <sup>3</sup> )	5162963	(b)
$V_{SHIP}$	Volume of waste in a truck shipment (yd <sup>3</sup> )	10	(c)
$F_T$	Fatality rate per truck-kilometer traveled (Fatalities/truck-km)	3.8E-8	(d)
$D_T$	Distance traveled per shipment (km) (Roundtrip JPG to Barnwell, SC = 730 mi; 730 mi X 1.6 km/mi = 1168 km)	1168	Derived estimate
Note: (a) NUREG-1727, Equation D6 (b) Mason and Hanger report Table G-2 (c) Typical shipment data (d) NUREG-1727, Table D2			
$Cost_{TF} = \$3,000,000 \times (5162963/10) \times 3.8E-8 \times 1168 \approx \$68,700,000$			

AND WHERE:

The Cost of DU remediation worker dose, $Cost_{WDose}$ , (from NUREG-1727, Equation D7): $Cost_{WDose} = \$2,000 \times D_R \times T$			
PARAMETER	DESCRIPTION/UNIT	VALUE	REFERENCE
2,000	Monetary value of a fatality equivalent to \$2000 per person-rem (\$/person-rem)	2000	(a)
$D_R$	Total effective dose equivalent rate to remediation workers (rem/hr) [(5 rem/yr)/(2080 hr/yr)] = 2.5E-3 rem/yr	2.5E-3	(b)
T	Time worked (site labor) to remediate the area (person-hours)	40,000	(c)
Note: (a) NUREG-1727, Table D2 (b) 10CFR20.1201 (c) Mason and Hanger report Figure G-2			
$Cost_{WDose} = 2000 \times 2.5E-3 \times 4E4 = \$200,000$			

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AND WHERE:

The combined other costs, Cost <sub>x</sub> , as detailed in the Mason & Hanger Report (from relevant parameters of NUREG-1727, Equation D3)			
PARAMETER	DESCRIPTION/UNIT	VALUE	REFERENCE
Cost <sub>x</sub>	Monetary cost of remediation action (may include "mobilization" costs), transport, disposal, treatment and other costs as appropriate for the situation (\$)	715,070,370	(a)
Note: (a) Mason and Hanger report Table G-2			

Substituting the variables and default values, Equation 7-1 reduces as follows (note that if F=1 the result is 3020):

$$\frac{Conc}{DCGL} = \frac{(5040 + 68,700,000 + 200,000 + 715,070,370)}{2000 \times 3E - 5 \times 0.025 \times 0.5 \times 5.19E6} \times \frac{0.03 + 1.55E - 10}{1 - e^{-(0.03 + 1.55E - 10)1000}} = 6040$$

7.4 The calculation demonstrates that the doses to the average member of the critical group are ALARA. This calculation assumes that the DU Impact Area is inhabited after all institutional controls have failed, hence the use of the average population density of Jefferson, Jennings and Ripley Counties, Indiana, and that the cost to remediate the DU Impact Area has neither increased nor decreased since the Mason and Hanger report<sup>10</sup> was published. (It was judged that the cost of remediation would be linear for varying depths. Therefore, if worst case scenario assumed four-foot soil depth, a two-foot soil depth would be half the cost). The residual radioactivity level that is ALARA occurs when the benefit of remediation equals the cost of remediation, i.e., when equation 7-1 is evaluated and the outcome is one. For the DU Impact Area (and the UXO within the DU Impact Area) the cost of remediation is 6040 times greater than the present benefit of collective dose averted; therefore, the residual radioactivity is ALARA. (While ALARA considerations were evaluated, the potential personnel safety concerns from UXO are the primary factor in not undertaking remedial activities).

<sup>10</sup> Final Study, Cleanup and Reuse Options, Contract No. DAAA09-92-C-0330, U.S. Army Jefferson Proving Ground, 15 October 1992, Mason and Hanger, Battelle Memorial Institute, Automation Research Systems, Limited.

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## **SECTION 8**

### **PLANNED DECOMMISSIONING ACTIVITIES**

NOTE: This section is not required for the intended license termination process. The license termination plan is not intended to include invasive DU remediation activities.

## **SECTION 9**

### **PROJECT MANAGEMENT AND ORGANIZATION**

#### **9.1 License Termination Management Organization.**

9.1.1 A description of the license termination organization including descriptions of the individual license termination project units within the license termination project organization:

9.1.1.1 U.S. Army Soldier and Biological Chemical Command (SBCCOM). The SBCCOM Safety Office will coordinate the LTP with the NRC (Indiana is within NRC Region III), the DA, and other agencies as deemed prudent by SBCCOM, such as the U.S. Environmental Protection Agency (EPA) (Indiana is within EPA Region 5), USFWS and USAF/Indiana Air National Guard; staff recommended changes and amendments with the same; consult with the U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM) on findings and recommendations provided to the appropriate agencies, as required; provide guidance and coordination between JPG, NRC, State agencies as required, USACHPPM, and DA Staff. [Mr. Paul Cloud, BRAC Environmental Coordinator, DSN 584-2381, commercial (410) 436-2381/Ms. Joyce Kuykendall, RSO, DSN 584-7118, commercial (410) 436-7118]

9.1.1.2 USACHPPM, Health Physics Program (HPP). Will develop the overall license termination plan for SBCCOM. Will assist in coordination and staffing of NRC license and non-NRC licensed concerns with DA, NRC and other agencies, as required, at the SBCCOM request. [LTC Mark A. Melanson, DSN 584-3502, commercial (410) 436-3502]

9.1.1.3 USACHPPM, Radiologic, Classic, and Clinical Chemistry Division (RCCCD). Will manage the overall Radiochemistry Laboratory efforts as required. Provide technical assistance to HPP, and perform all necessary laboratory analyses for samples generated for this project. [Mr. Gary W. Wright, DSN 584-8235, commercial (410) 436-8235]

9.1.1.4 Los Alamos National Laboratory (LANL), Environmental Science Group. Performed initial studies, models, and reports to support license termination. Will provide support and data as required for ongoing license termination activities.

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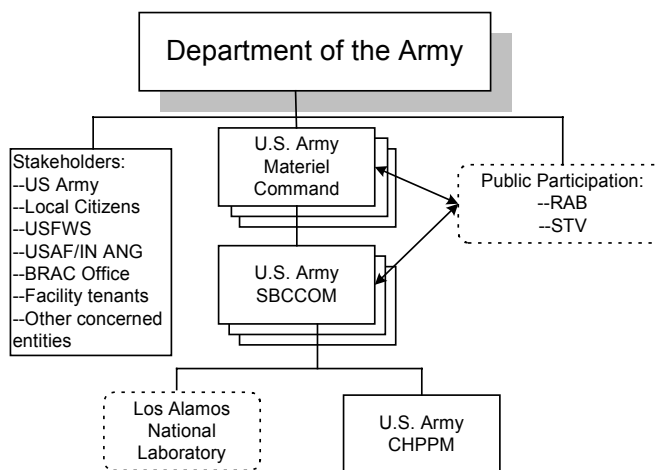
[Dr. Michael Ebinger, commercial (505)667-3147]

9.1.1.5 Stakeholders Various concerns which may use JPG, such as the DA, USFWS and the USAF, support, oversee, and maintain JPG are stakeholders. Other entities with direct concern are the U.S. Army SBCCOM BRAC Office, Save The Valley, citizens in surrounding communities, facility tenants, and various regulatory and non-regulatory agencies.

9.1.1.6 Public Participation Public participation, primarily through the Restoration Advisory Board and Save The Valley, encourages public input into the use of JPG. (Refer to Section 1.10 for a further discussion of public participation).

9.1.2 A description of the responsibilities of each LTP unit is as described in Section 9.1.1.

9.1.3 A description of the reporting hierarchy within the license termination project management organization including a chart or diagram: As the U.S. Army SBCCOM is the license holder, that organization has responsibility for oversight, development and execution for the license termination process and plans. Support organizations will report to SBCCOM. SBCCOM will follow the proper DA chain of command.



9.1.4 Safety will be the responsibility of all participants in the license termination process. Concerns and corrective actions should be resolved through the SBCCOM command.

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9.2 Decommissioning Task Management. It was determined that this section is not required for the intended license termination process. The license termination plan activities are not anticipated to include DU remediation activities.

9.3 License Termination Management Positions and Qualifications.

9.3.1 SBCCOM Command. Will have ultimate responsibility to provide resources and institute corrective action, as required, for the license termination process.

9.3.2 Radiation Safety Officer (RSO). Will provide coordination and assistance with radiation safety issues. Will review sample data and recommend corrective actions, as required, to SBCCOM command. Will conduct or arrange to have conducted annual reviews and/or audits of activities and site policies as required. [Ms. Joyce Kuykendall, (410)436-7118, <mailto:joyce.kuykendall@sbccom.apgea.army.mil>]

9.3.3 USACHPPM, HPP. Will develop the overall license termination plan. Will conduct sampling to support environmental monitoring program to extent required or requested. May conduct training to support site orientation/general safety program at JPG. The HPP may provide other support as needed or requested.

9.3.4 USACHPPM, RCCCD. To the extent required will perform laboratory analyses for samples to support environmental monitoring program or other samples to support license termination.

9.3.5 LANL, Environmental Science Group. Performed initial studies, modeling, and reports to support license termination. Will provide support and data as required for ongoing license termination activities. [Dr. Michael Ebinger, commercial (505)667-3147]

9.3.6 Department of Air Force. Will conduct operations, utilize and maintain property IAW MOA. (See Appendix B).

9.3.7 USFWS. Will conduct operations, utilize and maintain property IAW MOA. (Refer to Appendix B).

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9.4 Training. Orientation training will be provided to include DU safety training. Work specific training will be provided as appropriate. Training is outlined in the MOA Section III, 2, a (see Appendix B). DU and UXO training IAW the MOA has been provided to the USFWS and USAF/Indiana Air National Guard (June 2000).

9.5 Contractor Support. Contractors may be used to augment license termination efforts. Contractors will be provided site training and report to SBCCOM. Contractors will comply with radiation safety and license requirements.

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## **SECTION 10**

### **RADIATION SAFETY AND HEALTH PROGRAM DURING LICENSE TERMINATION**

NOTE 1: It was determined that this section is not required for the scope of the intended license termination process as guidance should be available in a site specific health and safety plan.

NOTE 2: As stated in a Request for Additional Information document<sup>11</sup> to the NRC, dated May 2000, the resolution to item 15 concerning safety plans was: The Army does not intend to conduct any remediation in the DU Impact Area so there will be no remediation radiation safety plan. The Army implements a safety plan for onsite use. This plan will be implemented IAW the provisions of the MOA (Appendix B).

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<sup>11</sup> Request for Additional Information on US Army Jefferson Proving Ground Site Decommissioning Plan, License SUB-1435, May 2000.

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## **SECTION 11**

### **ENVIRONMENTAL MONITORING AND CONTROL PROGRAM**

NOTE 1: It was determined that this section is not required for the scope of the intended license termination process as no remediation activities or effluent releases are anticipated.

NOTE 2: Environmental ALARA Evaluation Program. Doses to the general public and occupational doses will be maintained ALARA pursuant to 10 CFR 20. Employees will be made aware of their responsibilities to the ALARA commitment through the DU Safety Training. Training has been provided to the USFWS and Air National Guard personnel (June 2000). In addition, the USFWS and Air National Guard personnel provide site orientation training to visitors of their respective areas north of the firing line.

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## **SECTION 12**

### **RADIOACTIVE WASTE MANAGEMENT PROGRAM**

NOTE: It was determined that this section is not required for the intended license termination process as no DU remediation is anticipated to generate radioactive waste.

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### **SECTION 13**

#### **QUALITY ASSURANCE PROGRAM**

NOTE: It was determined that this section is not required for the scope of the intended license termination process as no remediation activities are anticipated to require collection of data and supporting quality assurance (QA) records for test equipment.

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## **SECTION 14**

### **DU IMPACT AREA RADIATION SURVEYS**

NOTE 1: It was determined that this section is not required for the scope of the intended license termination process as no remediation evolutions are anticipated.

NOTE 2: An initial characterization survey was conducted by the Scientific Ecology Group in 1995<sup>12</sup>. An environmental monitoring program<sup>13</sup> is still being conducted for groundwater, sediment, soil and surface water as part of the current license requirements.

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<sup>12</sup> Scientific Ecology Group, JPG DU Impact Area Scoping Survey Report, March 1995, Revision 0.

<sup>13</sup> U.S. Army Center for Health Promotion and Preventive Medicine Standing Operating Procedure, 10 March 2000, Depleted Uranium Sampling Program Environmental Radiation Monitoring Program, Jefferson Proving Ground, Madison, IN.

## **SECTION 15**

### **FINANCIAL ASSURANCE**

15.1 Cost Estimate. A reasonable estimate of annual costs to support license termination was developed. It is intended to be sufficient to allow an independent third party to assume responsibility for institutional controls and associated maintenance activities.

JPG License Termination Estimated Annual Institutional Control Costs	
Task/Activity/Component	Annual Cost (\$)
Road Maintenance	17,500.00
Perimeter Mowing	20,000.00
Perimeter Fence Inspection	96,500.00
Fence Repair	10,000.00
Fence Sign Monitor/Replace	4,000.00
DU Impact Area Surveillance	12,500.00
DU Sign Monitor/Replace	2,000.00
Annual Total	162,500.00
Note: This would be the total funds estimated to be necessary by the U.S. Army should the MOA with the USAF and the USFWS be terminated. With the MOA in effect, estimated U.S. Army expenses are \$15,000.00 per year.	

15.2 Certification Statement. It was determined that this section is not required for the scope of the intended license termination process.

15.3 Financial Assurance Mechanism. Statement of Intent. Refer to Appendix G. Because the Army is a government entity, it will satisfy the financial assurance requirement with a Statement of Intent.

## **SECTION 16**

### **RESTRICTED USE/ALTERNATE CRITERIA**

#### **16.1 Restricted Use**

16.1.1 Eligibility Demonstration. The risk assessment model used to estimate the radiological dose levels to an occasional user and resident farmer with and without institutional controls can be found in the JPG Risk Assessment<sup>14</sup> (Refer to Appendix F). A scenario was also tested which involves potential inhalation of DU particles as a result of fires on JPG lands. An ALARA analysis was performed in Section 7. The conclusion from the ALARA analysis is that the cost of remediation is significantly greater than the present benefit of collective dose averted, therefore, the residual radioactivity contained in the DU Impact Area is ALARA. IAW the restricted reuse termination exposure criteria with institutional controls, the license termination criteria, as established by the NRC, is satisfied.

#### **16.1.2 Institutional Controls**

16.1.2.1 Due to the UXO, the Firing Range is not suitable for commercial or residential development. A major portion of the area north of the Firing Line is used by the USFWS as the Big Oaks National Wildlife Refuge IAW the National Wildlife Administration Act of 1966 as amended (16 U.S.C 688) and other applicable laws. The USAF uses two smaller portions as bombing ranges. The purpose of implementing Institutional Controls is to prevent or reduce risks to human health and the environment while all parties are using the Firing Range. In order to control access to the DU Impact Area, physical and administrative controls are set forth in the MOA (refer to Appendix B) signed by the U.S. Army, USAF and the USFWS. These controls will be summarized in this section. Legal land use controls are not applicable here because the Firing Range, which contains the DU Impact Area, is not being transferred. Federal real property policy does not permit the creation of deed restrictions by a land holding agency, such as the U.S. Army.

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<sup>14</sup> Evaluation of Jefferson Proving Ground for Restricted Release: Risk Assessment Supporting NRC License Termination, Revised 8 February 2001, Dr. Michael H. Ebinger, Los Alamos National Laboratory.

16.1.2.1.1 As stated in the MOA, public use levels will be low and will be limited to hunting, gathering, fishing, and guided tours as determined by the interim and comprehensive access plans developed by the FWS. The Interim Public Access Plan is included in the MOA (refer to Appendix B). The Interim Public Access Plan is binding and in effect until the Comprehensive Conservation Plan is completed at which time it will replace The Interim Public Access Plan. Visitors receive a safety briefing on the hazards found on the property and are required to sign an Acknowledgement of Danger: Release and Hold Harmless Agreement. Certain visitors require escorted access. The USAF will be responsible for patrolling and maintaining the perimeter fence and related infrastructure to ensure the overall security of the Firing Range. The perimeter fence infrastructure includes warning signs, the road system associated with the perimeter fence, and mowing the perimeter fence area.

16.1.2.1.2 Restrictions on use of groundwater: The Firing Range is not to be used for residential purposes to include, but not limited to, housing, day care facilities, schools (excluding onsite employee training) and assisted living facilities. The groundwater quality is considered suspect for use as drinking water. The groundwater at JPG is considered non-potable, and public water from the city of Madison, IN is used. Users of surface water will be limited to recreational use.

16.1.2.1.3 Restrictions to the DU Impact Area are in place to permit access for personnel conducting official business only. Such personnel will be escorted by trained Army and/or USFWS personnel. The 2000 acres that comprise the DU Impact Area are locked, barricaded, and marked with radiation warning signs. A facility perimeter fence with "No Trespassing" signs and inner locked access road gates are in place and maintained to control access to the DU area and DU Impact Area. The DU area perimeter is identified as a restricted access area and includes "Caution - Radioactive Material" postings. In addition, key access for the locked barricades on access roads to the DU Impact Area is controlled IAW the MOA (refer to Appendix B). Key access is limited to authorized personnel. Quarterly lock and key inventories will be made of all issued keys.

16.1.2.1.4 Restrictions on excavation: Due to personnel safety concerns from UXO, no entity may conduct any

demolition, excavation, digging, drilling, or other disturbance of the soil, ground, or groundwater, or use soil, ground, or groundwater for any purpose, in the area north of the Firing Line without the prior written approval of the Army.

16.1.2.2 A description of any detriments associated with the maintenance of the institutional controls: As currently outlined, institutional controls have limited public, safety, or environmental detriments.

16.1.2.3 A description of the restrictions on present and future landowners: The Army will retain ownership of the area north of the firing line (the "Firing Range" in the MOA). Restrictions on use of the DU Impact Area will be IAW the terms and conditions identified in the MOA. This MOA will be incorporated into the existing land use planning and management system used at SBCCOM to ensure effective tracking and management of these restrictions at the installation.

16.1.2.4 A description of the entities enforcing and their authority to enforce institutional control(s): U.S. Army as licensee and deed title holder of JPG site; USFWS and USAF/Indiana Air National Guard as caretakers; and county sheriffs and state law enforcement who routinely patrol the site. Enforcement of refuge trespass and other public use violations will be the primary responsibility of the commissioned Refuge Law Officers and cooperatively by the Indiana Conservation Officers and other law enforcement agencies. General trespass, poaching, and other violations will be cooperatively enforced by these agencies. Jurisdiction is concurrent among agencies. These parties control and monitor access to the site. Authorization is established by MOA (refer to Appendix B).

16.1.2.5 A discussion of the durability of the institutional control(s): the controls specified in the MOA will remain in place for the duration of the MOA which is twenty-five years from 19 May 2000, with the option to renew this MOA for additional ten year periods. Additionally, IAW Department of Defense (DoD) policy, the Army will conduct a review of the MOA and associated land use controls every five years.

16.1.2.6 A description of the activities that the entity with the authority to enforce the institutional control(s) will undertake to enforce the institutional control(s): legal

action to the extent allowed by law may be pursued.

16.1.2.7 The manner in which the entity with the authority to enforce the institutional control(s) will be replaced if that entity is no longer able to enforce the institutional control(s) will be evaluated on a case by case basis. If the USFWS or the USAF fail to maintain adequate public access control for the Firing Range, the Army reserves the right to suspend their right of access IAW the MOA (Appendix B) to the Firing Range until appropriate corrective action is taken.

16.1.2.8 Institutional control(s) will remain in effect for the duration of the MOA or, in the event the MOA is terminated, the U.S. Army will be responsible to ensure these controls will remain in effect.

16.1.2.9 Corrective actions may be recommended to be undertaken by the USFWS, USAF or the SBCCOM RSO in the event the institutional control(s) fail. Such recommendations will be evaluated on a case-by-case basis.

16.1.2.10 A description of the records pertaining to the institutional controls, how and where they will be maintained and how the public will have access to the records: Inspection reports will be prepared and maintained by USFWS and provided to SBCCOM on a quarterly basis for archiving. Records pertaining to visitors (e.g., access permits, waivers of liability, Acknowledgements of Danger) will be maintained by the USFWS or the USAF as appropriate. The public will have access to records via request to SBCCOM or other appropriate agencies.

16.1.3 Site Maintenance. As is stated in the USAF Jefferson Range Access Plan, weekly inspections of the entire perimeter fence will be performed by range personnel and/or contractors. These inspections are not part of the inspection process for other environmental programs at JPG. All discrepancies will be reported so that any necessary repair action may be taken. If, during an inspection or through some other process, it becomes apparent that a land use control is being violated, appropriate installation officials should be notified immediately. These officials should take steps to ensure the integrity of the land use control is restored. If additional fencing, cleanup, or site security improvements are required due to past, present, or future Army activities, the Army will be responsible for the additional requirement. As stated in the

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Permits to USFWS and the USAF to Use Property Located on JPG, it is understood that maintenance, repair, protection, and restoration of the premises and providing utilities and other services, shall be effective only insofar as they do not conflict with the MOA or any other agreement.

16.1.3.1 USAF Site Maintenance Requirements. The MOA, Enclosure 5, states that the USAF shall maintain applicable roads, road shoulders and low water crossings, as well as associated bridges and culverts. In addition, the USAF will maintain warning signs around the entire perimeter of the firing range as well as around the sub-munitions area west of Machine Gun Road and the former Open Detonation area. The USAF shall maintain the cultural resource properties of the Firing Range.

16.1.3.2 USFWS Site Maintenance Requirements. The FWS shall maintain all buildings, roads, road shoulders, bridges, low water crossings, and culverts, not maintained by the USAF, which are required for Refuge operations. FWS shall provide road maintenance sufficient for 4 x 4 vehicle access to the DU monitoring wells.

#### 16.1.4 Obtaining Public Advice.

16.1.4.1 Public participation and input in the license termination process is pursued by distribution of information via a mailing list, announcements in local media and periodic RAB meetings. (Note: The RAB serves the function of a site-specific advisory board). The JPG mailing list was initially established by including members of the public in attendance at various JPG meetings between 1994 and 1995, regardless of which agency held the meeting (e.g., Army, NRC, FWS, Congressional). In 1995, a formal revision to the Army's JPG Community Relations Plan was conducted and a new mailing list was prepared at that time, to include the previous list, and this list is still in effect at this time.

16.1.4.2 A summary of this proposed action (i.e., license termination for restricted release) has been prepared and distributed to the public via the mailing list. The purpose of this summary was to provide a description of the proposed efforts and seek advice from the public on whether the provisions for institutional controls will provide reasonable assurance that the total effective dose will not exceed 25 mrem/yr (0.025 rem/yr)

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and whether the provisions for these institutional controls will be enforceable and not impose an undue burden on the community or other affected parties. A thirty-day public comment period was provided, with the closure of this comment period coinciding with the February 2001 RAB meeting. Refer to Appendix H for ways to access the records of RAB meetings. Refer to Appendix I for a DU summary sheet distributed at the RAB meeting. Any comments received during this comment period, and the Army responses to these comments, will be summarized. The Army responses will include its rationale for incorporating, or not incorporating, the advice received from the public members of the community.

16.1.4.3 Any issues raised at the JPG RAB meetings concerning this license termination effort will be documented by the court reporter and these verbatim minutes will be included in the Administrative Record at the Hanover College, Hanover, IN, and also provided to the RAB members.

16.1.5 Dose Modeling and ALARA Demonstration. Dose modeling projections range from 2.5 mrem/yr (0.0025 rem/yr) for the controlled burn scenario to 4 mrem/yr (0.004 rem/yr) for the occasional user (e.g., institutional controls in place) to 63 mrem/yr<sup>15</sup> (0.063 rem/yr) for the resident farmer (e.g., institutional controls not in place). Further reduction would be cost prohibitive and may cause human and environmental harm. Institutional controls are in place to restrict unauthorized access to the site.

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<sup>15</sup> Evaluation of Jefferson Proving Ground for Restricted Release: Risk Assessment Supporting NRC License Termination, Revised 8 February 2001, Dr. Michael H. Ebinger, Los Alamos National Laboratory.